Review$_1$: *Midterm Exam*

Name: _____

1. A sample of Helium gas has a temperature of 273 K, a pressure of 85.5 KPa and a volume of 2.50 L. What is the temperature of the gas if the volume is changed to 3.40 L and the pressure is changed to 65.0 KPa? *(8 pts)*

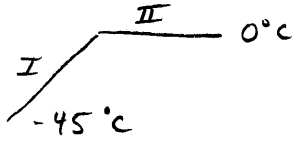
	P	T	V	n
Initial				
Final				
Effect				

$$\frac{PV}{nT} = \frac{PV}{nT}$$

$$\frac{(85.5)(2.50)}{n(273)} = \frac{(65.0)(3.40)}{nT}$$

$$T = 282\ K$$

2. A 90.0 g sample of ice at -45.0°C ends up completely melted into liquid water at 0.0 °C. How much energy is involved in this change?



I. $mc\Delta T$

$(90.0)(2.1)(0-(-45)) = 8505\ J$

II mH

$(90)(334) = 30060\ J$

TOTAL $39000\ J$

$39\ KJ$

3. Electrons in atoms

a. Write out the spectroscopic notation (ex. $1s^2$, $2s^2$, etc.) for the following atoms:

(i) Iodine (53) $[^{36}Kr]\ 5s^2 4d^{10} 5p^5$

(ii) Cobalt (27) $[^{18}Ar]\ 4s^2 3d^7$

(iii) Europium (63) $[^{54}Xe]\ 6s^2 4f^7$

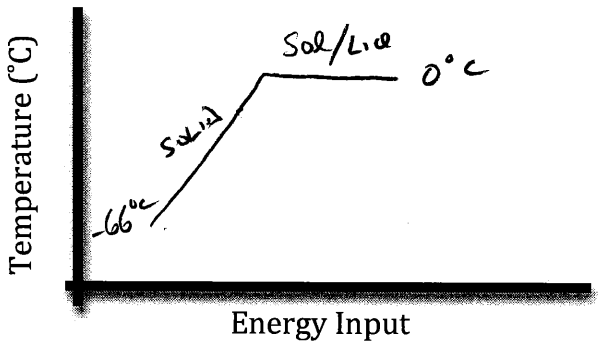
(iv) Chromium (24) $[^{18}Ar]\ 4s^1 3d^5$ ← WHY THE SWITCH?

4. A student takes a 575 g block of ice at -66°C and heats it until exactly half of the ice melts.

Energy constants (H_2O)

334 J/g	Heat of fusion (melting or freezing) H_f	**$Q = m\,C\,(T_f - T_i)$**
2260 J/g	Heat of vaporization (evaporating or condensing) H_v	
2.0 J/g°C	Heat capacity (c) of water vapor	**$Q = m\,H$**
2.1 J/g°C	Heat capacity (c) of solid water	
4.18 J/g°C	Heat capacity (c) of liquid water	

a. Sketch in the heating curve of water, and label the beginning and ending points of the problem.



b. How much total energy is involved in the heating and melting described above?

$mC\Delta T$

$(575)(2.1)(66) = 79695\ J$

mH

$(\frac{1}{2})(575)(334) = 96025\ J$

TOTAL = 180 KJ

WHY DOES THE SECOND EQUATION HAVE A 1/2 IN IT?

5. Suppose that you lowered the temperature of a gas from 100°C to 50 °C. By what factor do you change the volume of the gas?

$\frac{V}{T} = \frac{V}{T}$

$\frac{100\%}{373\ K} = \frac{V}{323K}$

$V = 86\%$

THE VOLUME DROPS BY 14%

6. Suppose that 25.0 mL of a gas at 725 mm Hg and 20°C is converted to standard pressure and temperature. What would be the new volume?

$\frac{PV}{nT} = \frac{PV}{nT}$

$\frac{(725)(25)}{(293)} = \frac{(760)(V)}{(273)}$

S.T.P IS 0°C AND 1 ATm

$V = 22\ mL$

7. Write the electron configuration for the following using, $1s^2 2s^2 2p^6$ Etc.

Cobalt $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^7$

Radon $[^{54}Xe]\ 6s^2 4f^{14} 5d^{10} 6p^6$

* Uranium $[^{86}Rn]\ 7s^2 4f^4$

Magnesium $1s^2 2s^2 2p^6 3s^2$

** Silver $[^{36}Kr]\ 5s^1 4d^{10}$

* IF you looked it up online or in an app it will likely say $[Rn]\ 7s^2 5f^3 6d^1$

** Why does Silver only have 1 e^- in its 5s orbital?